Linking scales in assessments of mitigation options for riverine nutrient reduction

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When analyzing impacts of mitigation measures for nutrient reduction in surface water and groundwater it is important to be able to compare different mitigation alternatives to assure that that the most efficient measures, to the best of knowledge, are taken. In such a complex system as the agricultural, different alternatives are not easily compared, especially if the conditions for the system change over time, e. g. climatic, demographic and technological changes. To ensure that the best decision is taken decision support is needed.

To meet needs like this the HYPE (Hydrological Predictions for the Environment) model was developed. The model is a dynamic, semi-distributed and process-based model based on well-known hydrological and nutrient transport concepts. It integrates soil, groundwater, surface water, lakes and rivers. The HYPE model can be applied with different resolution in time and space. In Sweden, it is used in the implementation of the EU water framework directive, providing daily time-series of water quantity and quality data with 10 km2 resolution for the whole country. The model is especially efficient in linking scales in an operational production system for large regions.

In its European set-up, called E-HYPE, the model covers nearly 9 million km2 divided into more than 36000 sub basins (average area 213 km2). Input data was taken from readily available, free data bases such as Corine and Globcover for land cover and European Soils Database and Digital Soil Map of the World.

Due to its flexibility HYPE can also be set up in smaller scales in order to link processes at local or even plot level to coarser resolutions in both time and space.

So far, the model has been used to assess source apportionment of nutrient load on the sea, reconstruction of historic discharge and nutrients at daily time-step (1971 to 2008), analysis of the implementation of the Baltic Sea Action Plan (BSAP) including climate change impact on water and nutrients for present emissions and diffuse sources in the basin and the combined effect of BSAP implementation and climate change on nutrient load to the Baltic Sea. In addition, the model is run in forecast mode with automatic delivery of 2-10 days water and nutrient forecasts to different oceanographic communities such as the Baltic Operational Oceanographic System, the North West European Shelf Operational Oceanographic System for direct input to several oceanographic forecast models.

Results from HYPE are readily available on the internet via web products. E-HypeWeb is a public web service where where you can easily download daily and monthly simulation results of discharge (m3/s) for one or several sub basins in Europe. Data for download can be chosen by either specifying a sub basin ID or selecting areas from a map. In addition, nutrient loads can be downloaded for the Baltic Sea basin.